Real and Relevant Mathematics:

IS IT REALISTIC IN THE CLASSROOM?

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reminds us what real and relevant mathematics means to children and outlines how teachers can plan purposeful activities and provide relevant contexts in the classroom.

How many times have you heard the cry, "Why are we doing this?" or, "When will we need this?" as children are presented with their next task in mathematics. For many children, the mathematics of the classroom has no obvious connection to the mathematics of their world. The two are separated and unconnected. The mathematics of the classroom, it appears, is not relevant for a large number of primary aged children.

Nowadays much is written and said about issues such as "real life" or "real world" mathematics, relevant mathematics and mathematics in context. Teachers and educators talk about realistic, meaningful, or purposeful tasks and mathematics. Teacher education students continually report that mathematics should be relevant to children and in a real-life context.

Real mathematics

One of the important aims of teaching mathematics is to prepare students to meet the mathematical requirements of everyday living. The National Council of Teachers of Mathematics (2000) highlighted this aim when they announced:

> The need to understand and be able to use mathematics in everyday life and in the workplace has never been greater (p. 4).

In addition, many definitions of numeracy emphasise the central role of mathematics in life beyond the school gates. For example, Willis (2000, as cited in Hogan, 2002, p. 1) has defined numeracy as: "intelligent, practical mathematical action in context." The notion of real mathematics is, however, confused in the minds of many people. For some, it refers to mathematics that occurs in the real world or in real life, for others it is about doing mathematics, much in the way a mathematician would use mathematics to solve a problem or explore a situation. In most cases, real mathematics is different from the mathematical diet that many children will receive from textbooks, commercial blackline master sheets, and classroom whiteboards.

Many textbooks attempt to use real mathematics by having children apply mathematical ideas to a real-world problem or by setting tasks within a familiar context. This technique is useful as it allows children to see the connection of school mathematics to situations and contexts met by people outside the classroom. There are, however, two issues relating to the general use of applications and contexts adopted in some textbooks. They are both concerned with the notion of *pseudo-relevance* or what Burkhardt (1981) called a "dubious problem." This is a problem that is little more than a "dressed-up" calculation exercise that usually follows a page of similar calculations. For example, area problems are often set in a "carpeting a room" context. Although carpet is sold in square units and in that sense is relevant to area, there are a number of subtleties and issues that need to be acknowledged. Most nine and ten year old children who might be learning about area are not interested in carpeting rooms or tiling bathrooms. Thus, while the task is placed in a context, the context is not relevant or of immediate interest to a majority of children.

Bickmore-Brand (1998) identified another issue for noting when setting mathematics within a context. She highlighted the difference between the often "sanitised" school version of problems in context and the messy and more complex real situations. Blinko (2004) noted that the information provided has a "Goldilocks feel" to it, as it is "just right": there is neither too much nor too little. All that is left for the solver is to identify the numbers and the correct operation to perform to obtain the answer. For example, in the carpet-laying context, the purchaser would in reality measure the outline of the floor area to be carpeted and decide on the colour and pattern of the carpet to be purchased. The salesperson or possibly the actual carpet fitter would do the final calculations to identify how much carpet had to be purchased and its cost. Carpet is generally sold in lengths (2 metres wide), which are then cut and fitted together to cover the designated area. The fitter has to make allowance for pattern match and pile fall. The cost will include an amount for wastage. A simplified, textbook solution of calculating the area of the room and then purchasing exactly that amount of carpet from the shop might not, in reality, give you a pleasing coverage of carpet.

Adding relevance and reality to the mathematics diet

Bringing a sense of relevance and realism to the primary classroom is not an easy task. What constitutes relevance and reality in mathematics teaching and learning will vary between classrooms and within classrooms because children are different and are interested in different things. Some children fail to see any relevance or connect any meaning from the tasks they undertake. An analogy with art may help to clarify the issue. As part of art classes children learn about mixing paint colours to achieve another colour, applying paint in certain ways to achieve a specific effect, perspective, the direction of light, and possibly about how to arrange people and objects in space to form a pleasing composition. They then use these techniques to paint a picture. That is, they act as an artist. So often in mathematics children are taught the math-

ematical equivalent of mixing paint but rarely or never act as a mathematician and use the skills and facts they have been taught. Thus the skills, procedures and facts have no relevance and purpose to many children.

The Realistic Mathematics Education (RME) movement in the Netherlands (Treffers & Beishuizen, 1999) views mathematics as a human activity and engages children in "mathematising." Here children work with realistic mathematics, that is, they engage in mathematical activities that are "experientially real" to them. The RME viewpoint attempts to illustrate the applicability and relevance of mathematics in real-world situations by taking contexts as a starting point for learning mathematics.

A possible way to make mathematics experientially real and to have children engaged in mathematising is to plan using the diagram in Figure 1 (Booker, Bond, Sparrow & Swan, 2004, p. 386).

Deciding on the situation to explore is an important part of the planning process. Some situations are more amenable to exploration and investigation than others. Such situations tend to be open-ended in design to allow the children to work at different levels of complexity and in different directions. Sullivan and Lilburn (1997) offered excellent guidelines for developing open tasks from everyday closed questions. Tasks for exploration do not have to be complex or difficult to explain. For example, Sparrow and Swan (2005, p. 18) have suggested investigating the patterns formed when names are written on various sizes of grid-paper. This is not real-world mathematics. Children will not meet this situation in their everyday lives. It is, however, relevant and interesting, for many children, because it is about them and their name.

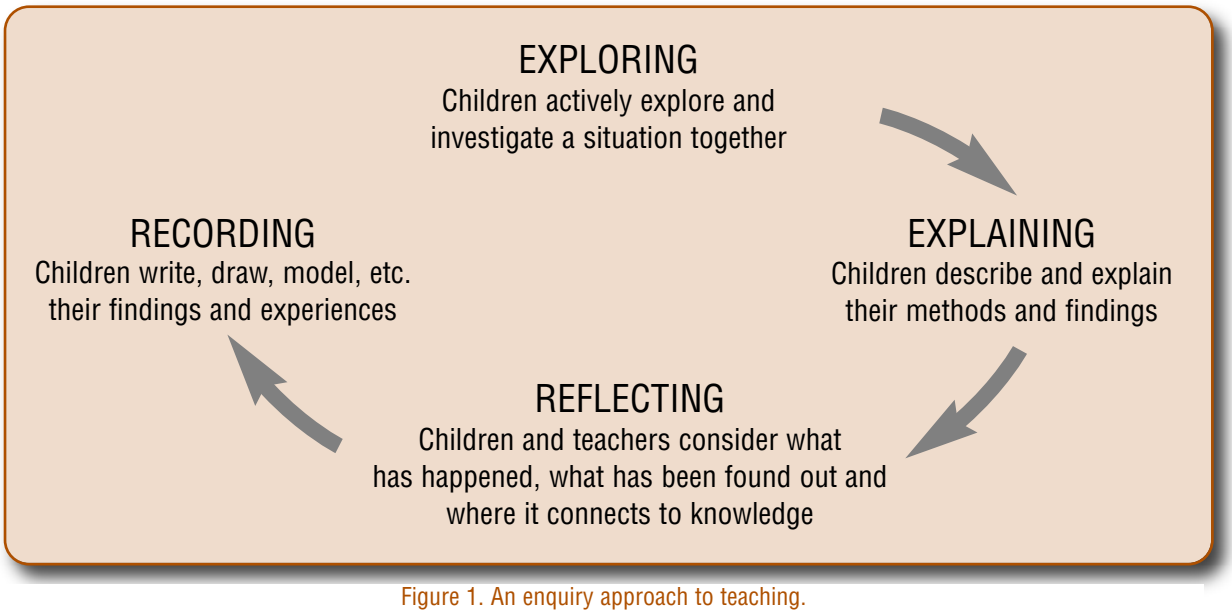

Figure 1. An enquiry approach to teaching.

Patterns with names

Equipment

Sheets of cm or 2 cm grid paper
Pre-cut strips of grids 2 × 6, 3 × 6, 4 × 6, 5 × 6

Task

On an overhead projector or board use a three-letter name to fill in the squares of a 3 × 6 grid (Figure 2) in the following way:

L	E	N
L	E	N
L	E	N
L	E	N
L	E	N
L	E	N

Figure 2. Three-letter name.

P	A	U
L	P	A
U	L	P
A	U	L
P	A	U
L	P	A

Figure 3. Four-letter name.

Ask children to describe what has happened, i.e., the letters appear in columns. Ask which other names will also form a column pattern with this grid, for example Pat. Ask them to predict and describe the pattern formed on the same grid by a four-letter name (see Figure 3). Children are then set the task of drawing a grid so that writing their name results in a column pattern (a grid with the same number of squares across the top as their name has letters). Once this is established, children can begin to explore their name on different sizes and configurations of grids. This is quite a general activity and can be used to a greater or lesser degree with children of all ages in the primary school.

Open tasks or situations can also be used to help children pose their own questions to be answered. Brown and Walter (1972) noted the idea of problem posing whereby children ask their own questions to be investigated or pose their own problems to be solved by using the sentence stem *What if …?* For example, in the name grid investigation they might ask, "What if I used a different way to place the letters of my name?" The children then have a slightly different idea to investigate. This task now has more relevance to them.

Devising purposeful activities

Haylock (1991) has devised a very useful planning chart (Figure 4) that allows teachers to identify activities and contexts that can be both purposeful and meaningful to learners.

Haylock also noted the use of *competitions* — for example, who can say, "Supercalifragilisticexpialidocious the greatest number of times in 30 seconds?" — and *game playing* but did not include them in the matrix as they effectively provide their own context of meaning and criteria for success.

The intersections on the matrix provide a possible combination of meaningful context and purposeful activity. For example, the section combining *planning an event* and *fund-raising* could lead to children devising ways to raise money to support a school or class nominated charity.

Finding out children's interests

One of the main issues with trying to plan for work that is of interest or relevance to children is to discover exactly what is of interest to them. This is no easy thing as interests change quickly. The pop-star idol of today is the quickly forgotten one-hit-wonder of yesterday. A one-size-fits-all approach often does not work, as many in the class are not interested in the latest pop star or the footy team or the "must-have" toy craze.

One way to find out what children are interested in is simply to ask them. Questionnaires with "stem statements" can offer an insight to the range of interests within the classroom at

MEANINGFUL CONTEXTS	PURPOSEFUL ACTIVITIES				
	SOLVING A REAL PROBLEM	PLANNING AN EVENT	DESIGNING AND CONSTRUCTING	SIMULATION	ROLE-PLAY
SCHOOL ORGANISATION					
CLASSROOM					
TV AND VIDEO					
LIFE AT HOME					
SHOPPING					
FUND RAISING					
COOKING					
TRAVEL					
SPORT					

Figure 4. Planning matrix.

that particular time (see Figure 5). These surveys can be handwritten or electronic. Data provided here can be used for simple graphing but also for choosing contexts for tasks.

Name:
At home I…
My interests are…
At the weekend I usually…
On holiday from school I…
When I watch television I like…
My birthday is…

Figure 5. Children's interests survey.

Integrated units of work

Many teachers see integrating learning areas as being one way of bringing realism to mathematics learning and teaching. Using mathematics in other learning areas, for example measuring growth and change in a science experiment, or developing symmetrical patterns in art, can add a degree of relevance for children. A unit of work on *Ourselves* provides a good vehicle for measuring real things for a purpose as children endeavour to produce scale models of themselves and develop a database of information for use in further problems that may arise. Working with a unit on Supermarkets can bring together mathematics in the local community with skills needed in life outside the classroom.

Conclusions

Combating the perception of many adults and children that mathematics is difficult, irrelevant and not for them is a major task for teachers and one that is not easily achieved. Attempts to place mathematics in real-life situations or to use contexts to alleviate the apparent separation of school mathematics and out-of-school mathematics have been only partially successful.

If children can experience real mathematics that engages them by connecting with their interests of the moment, and also work with purposeful activities that bring together mathematical skills and knowledge that they have, then there may be a better chance that children will become engaged and experience success in mathematics. Mathematics becomes real when children explore and solve problems that require them to use their mathematical knowledge and skills in contexts that are neither contrived nor sanitised. Issues of relevance and reality along with purpose in mathematics teaching and learning are important and teachers and educators have the difficult task of bringing them to the primary mathematics classroom.

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